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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 08/558,544 | 11/16/1995 | SHUNPEI YAMAZAKI | 0756-1441 | 3919 |

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EXAMINER

KANG, DONGHEE

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| ART UNIT | PAPER NUMBER |
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2811

DATE MAILED: 09/25/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

08/558,544

Applicant(s)

YAMAZAKI, SHUNPEI

Examiner

Donghee Kang

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 August 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-59 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-4, 6, 14-18, 20, 23-28, 43, 51 and 54 is/are allowed.
- 6) ☒ Claim(s) 5, 8-9, 19, 22, 29-32, 34-37, 39-40, 48-50, 52, 53 and 55-59 is/are rejected.
- 7) ☒ Claim(s) 7, 10, 21, 32, 37, 41-43 and 45-47 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 37.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on August 19, 2002 has been entered.

Information Disclosure Statement

2. Acknowledgment is made of receipt of applicant's Information Disclosure Statement (PTO-1449) filed August 19, 2002.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims **5 & 19** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 5 recites the limitation "said substrate" in lines 5 & 10.

Claim 19 recites the limitation "said substrate" in lines 5 & 9.

There are insufficient antecedent basis for the above limitation in the claims 5 and 19.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims **5, 8, 19, 22, 29, 30, 48, 49, 52, 53 & 55** are rejected under 35 U.S.C. 103(a) as being unpatentable over Koji (JP 2,143,572) in view of Morozumi (US 4,862,237).

Regarding claims **5 & 19**, Koji discloses a device for sensing a light comprising (Fig.3G):

a semiconductor layer (2) over an insulating substrate (1); a photoelectric conversion semiconductor device on said substrate, a semiconductor region of the photoelectric conversion semiconductor device comprising a p-type impurity (2-1) semiconductor region, an intrinsic semiconductor region (2-2), and an n-type impurity semiconductor region (2-3); and a thin film transistor over the substrate, an active layer of the thin film transistor comprising a source region, a drain region, and a channel region;

wherein said semiconductor regions are arranged in order with said p-type impurity semiconductor region adjacent said intrinsic semiconductor region and said intrinsic semiconductor region adjacent said n-type impurity semiconductor region in said photoelectric conversion semiconductor device, said order being in a direction perpendicular to that in which a light to be sensed is incident thereon, and wherein the

semiconductor region of the photoelectric conversion semiconductor device and the active layer of the thin film transistor comprise the same semiconductor layer.

Although the device of Koji was not fabricated by same process step as claimed invention, the resultant structure of the process steps in claims are anticipated by Koji.

The product-by-process claims are given no patentable weight. A product-by-process claim directed to the product per se, no matter how actually made, In re Hirao, 190 USPQ 15 at 17 (footnote 3). See In re Fessman, 180 USPQ 324, 326 (CCPA 1974); In re Marosi et al., 218 USPQ 289, 292 (Fed.Cir.1983); and particularly In re Thrope, 227 USPQ 964, 966 (Fed. Cir. 1985), all of which make it clear that it is the patentability in a "product-by-process" claim, and not the patentability of the process step, which must be determined in a "product-by-process" claim, and not the patentability of the process. See also MPEP 2113. Moreover, an old and obvious product produced by a new method is not a patentable product, whether claimed in "product by process" claims or not.

Koji does not teach forming a SiO₂ layer on the insulating substrate. However, Morozumi teaches forming a TFT and light sensor on the insulating substrate (20) covered over entire area of its surface with a silicon oxide film (21). See also Fig.4. Therefore, it would have been obvious in the art at the time the invention was made to substitute the insulating substrate of Koji with the insulating substrate covered with silicon oxide taught by Morozumi in order to improve the signal to noise ratio.

Regarding claims **8, 22, 29 & 30**, Koji discloses a device for sensing a light comprising (Fig.3G):

a light sensor region and a semiconductor switch region (TFT) adjacent to and operatively connected with said light sensor region over an insulating substrate, wherein a semiconductor region of the light sensor region and an active region of the semiconductor switch region comprise the same semiconductor layer formed on the insulating substrate. Koji does not teach forming a SiO₂ layer on the insulating substrate. However, Morozumi teaches forming a TFT and light sensor on the insulating substrate (20) covered over entire area of its surface with a silicon oxide film (21). Therefore, it would have been obvious in the art to have the SiO₂ layer of Morozumi in Koji for the same reason as given for the rejection of claim 5 (see above).

Neither Koji nor Morozumi teach the semiconductor layer has at least one of an electron mobility greater than 15 cm²/Vsec and a hole mobility greater than 10 cm²/Vsec. However, it would have been obvious in the art at the time the invention was made to select the electron mobility and hole mobility of the claimed invention because they depend on desired speed of the device.

Regarding claims **48, 49 & 52, 53, 55**, Koji as modified by Morozumi teaches the light sensor device uses in the electric equipment, such as a facsimile machine and image sensor.

7. Claims **9, 11-13, 31, 32, 34-37, 39-40, 50, & 56-59** are rejected under 35 U.S.C. 103(a) as being unpatentable over Koji in view of Morozumi and further in view of Misawa et al. (US 5,250,931).

Regarding claims **9 & 11-12**, Koji teaches a semiconductor device comprising (Fig.3G):

a light sensor region and a semiconductor switch region (TFT) adjacent to and operatively connected with said light sensor region over an insulating substrate, wherein a semiconductor region of the light sensor region and an active region of the semiconductor switch region comprise the same semiconductor layer (polycrystalline Si) formed on the insulating substrate, wherein a Raman spectrum of the semiconductor layer (polycrystalline Si) exhibits a peak deviated from that which stands for a single crystal for the semiconductor,

wherein said light sensor region comprises at least two semiconductor regions having different electrical properties and forming a junction,

wherein said two semiconductor regions in said light sensor region are arranged in a lateral direction on said substrate.

Koji does not teach forming a SiO₂ layer on the insulating substrate. However, Morozumi teaches forming a TFT and light sensor on the insulating substrate (20) covered over entire area of its surface with a silicon oxide film (21). Therefore, it would have been obvious in the art to have the SiO₂ layer of Morozumi in Koji for the same reason as given for the rejection of claim 5 (see above).

Neither Koji nor Morozumi teaches the semiconductor switch comprises complementary p-channel and n-channel thin film transistors. However, Misawa et al. teaches in Fig.4D the driver circuit portion comprises p-channel and n-channel thin film transistors (132 & 133). Thus it would have been obvious to one of ordinary skill in the

art at the time the invention was made to combine the teaching of Misawa with Koji as modified by Morozumi, since the complementary p-channel and n-channel thin film transistors requires a small power to operate the device. Such modification provides Koji's device as modified by Morozumi with lower power consumption.

Regarding claim **13**, none of prior art teaches the semiconductor layer has at least one of an electron mobility greater than $15 \text{ cm}^2/\text{Vsec}$ and a hole mobility greater than $10 \text{ cm}^2/\text{Vsec}$. However, it would have been obvious in the art at the time the invention was made to select the electron mobility and hole mobility of the claimed invention because they depend on the desired speed of the device.

Regarding claims **31, 32, & 58**, Koji teaches a semiconductor device comprising (Fig.3G):

an insulating substrate, first and second islands on said substrate; p-type impurity region in said first semiconductor island with a first channel region interposed therebetween and in a first region of said third semiconductor island; an insulating film (4) on said first and second semiconductor islands; a gate electrode (2-1) over said first channel regions with said insulating film interposed therebetween,

wherein a Raman spectrum of each of said first and second semiconductor islands exhibits a peak deviated from that which stands for a single crystal of the semiconductor.

Koji does not teach forming a SiO_2 layer on the insulating substrate. However, Morozumi teaches forming a TFT and light sensor on the insulating substrate (20) covered over entire area of its surface with a silicon oxide film (21). Therefore, it would

have been obvious in the art to have the SiO₂ layer of Morozumi in Koji for the same reason as given for the rejection of claim 5 (see above).

Neither Koji nor Morozumi teaches the semiconductor switch comprises complementary p-channel and n-channel thin film transistors. However, Misawa et al. teaches in Fig.4D the driver circuit portion comprises p-channel and n-channel thin film transistors (132 & 133). Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Misawa with Koji as modified by Morozumi, since the complementary p-channel and n-channel thin film transistors requires a small power to operate the device. Such modification provides Koji's device as modified by Morozumi with lower power consumption.

Regarding claim **34-35 & 39-40**, none of the prior art teaches p-type impurity regions contains boron and n-type impurity regions contain phosphorus. However, it is conventional to use boron when p-type implants are required and phosphorus when n-type implants are required. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use boron and phosphorus since they are known materials well suited for intended purpose.

Regarding claims **36-37 & 59**, Koji teaches a semiconductor device comprising (Fig.3G):

an insulating substrate, first and second islands on said substrate; p-type impurity region in said first semiconductor island with a first channel region interposed therebetween and in a first region of said third semiconductor island; an insulating film

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(4) on said first and second semiconductor islands; a gate electrode (2-1) over said first channel regions with said insulating film interposed therebetween,

Koji does not teach forming a SiO₂ layer on the insulating substrate. However, Morozumi teaches forming a TFT and light sensor on the insulating substrate (20) covered over entire area of its surface with a silicon oxide film (21). Therefore, it would have been obvious in the art to have the SiO₂ layer of Morozumi in Koji for the same reason as given for the rejection of claim 5 (see above).

Neither Koji nor Morozumi teaches the semiconductor switch comprises complementary p-channel and n-channel thin film transistors. However, Misawa et al. teaches in Fig.4D the driver circuit portion comprises p-channel and n-channel thin film transistors (132 & 133). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Misawa with Koji as modified by Morozumi, since the complementary p-channel and n-channel thin film transistors requires a small power to operate the device. Such modification provides Koji's device as modified by Morozumi with lower power consumption.

Regarding claim **50, 56, & 57**, Koji teaches the light sensor device uses in the electric equipment, such as a facsimile machine and image sensor.

Allowable Subject Matter

8. Claims **1-4, 6, 14-18, 20-28, 44, 51 & 54** allowed.
9. The following is an examiner's statement of reasons for allowance:

No prior art teaches a semiconductor region of the light sensor and an active region of the semiconductor switch comprises a semi-amorphous structure formed on a blocking layer over the insulating substrate.

10. Claims 7, 10, 21, 33, 38, 41, 42, 45, 46, & 47 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Donghee Kang whose telephone number is 703-305-9147. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 703-308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

DHK
September 23, 2002

Steven Loh
Steven Loh